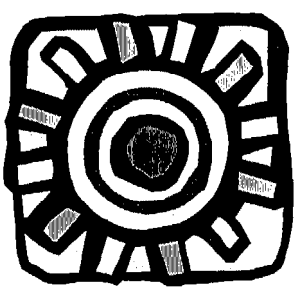
ATTACHMENT A

INFORMATION ABOUT THE NO ACTION ALTERNATIVE; MODELING ASSUMPTIONS FOR EXISTING CONDITIONS, THE NO ACTION ALTERNATIVE, AND THE PROGRAM ALTERNATIVES; AND ACTIONS THAT MAY CONTRIBUTE TO CUMULATIVE IMPACTS



Information about the No Action Alternative; Modeling Assumptions for Existing Conditions, the No Action Alternative, and the Program Alternatives; and Actions That May Contribute to Cumulative Impacts

Implementation of the CALFED Bay-Delta Program is expected to occur over the next 30 or more years. Future conditions cannot be predicted with certainty. To compare the environmental consequences of the Program to existing conditions and conditions anticipated in 2020 required making many assumptions about the present and the future, including the assumptions that were used to evaluate impacts and model Bay-Delta system water parameters.

LIST OF TABLES

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LIST OF ACRONYMS

Agency	Sacramento County Water Agency
ARWI	American River Watershed Investigation
ARWRI	American River Water Resource Investigation
Banks Pumping Plant	Harvey O. Banks Delta Pumping Plant
BMPs	best management practices
CCFB	Clifton Court Forebay
CCWD	Contra Costa Water District
cfs	cubic feet per second
Corps	U.S. Army Corps of Engineers
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
D-	Water Right Decision
DCC	Delta Cross Channel
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
EBMUD	East Bay Municipal Utility District
EC	electrical conductivity
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
ESA	Endangered Species Act
ETo values	reference evapotranspiration
EWA	Environmental Water Account
FERC	Federal Energy Regulatory Commission
FSC	Folsom South Canal
GCID	Glenn-Colusa Irrigation District
gpcd	gallons per capita per day
Interior	U.S. Department of Interior
ISDP	Interim South Delta Plan
JPD	joint point of diversion
MAF	million acre-feet
mgd	million gallons per day
mg/L	milligrams per liter
M&I	municipal and industrial
MOA	memorandum of agreement
MPP	multi-purpose pipeline
MWD	The Metropolitan Water District of Southern California
NCP	navigation control point
NDWA	North Delta Water Agency
NMFS	National Marine Fisheries Service
PL	Public Law
Reclamation	U.S. Bureau of Reclamation

LIST OF ACRONYMS
(CONTINUED)

SB	Senate Bill
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids
USFWS	U.S. Fish and Wildlife Service
VAMP	Vernalis Adaptive Management Plan
WQCP	1995 Water Quality Control Plan for the Bay-Delta

A. Information about the No Action Alternative; Modeling Assumptions for Existing Conditions, the No Action Alternative, and the Program Alternatives; and Actions That May Contribute to Cumulative Impacts

A.1 SUMMARY

This attachment includes the following:

- Physical facilities included in the No Action Alternative.
- Non-physical facilities and nonmodeling assumptions included in the No Action Alternative.
- Modeling assumptions for existing conditions, the No Action Alternative, and the Program alternatives.
- Comments and issues about the No Action Alternative.
- Actions that may contribute to cumulative impacts.

A.2 NO ACTION ALTERNATIVE

The No Action Alternative is used as a basis to compare the Program alternatives. This comparison is made to highlight the changes to the environment that would take place as a result of implementing the Program alternatives. The Program also is comparing the Program alternatives to existing conditions, which are referred to as the affected environment in this document.

A.2.1 Physical Facilities Included in the No Action Alternative

The No Action Alternative includes physical facilities that will be implemented independent of Program actions. The criteria for inclusion of physical features in the No Action Alternative are:

- Had the action been approved for implementation?
- Was the action funded for implementation?
- Were final environmental documents prepared for the action?
- Were final environmental permits issued for the action?
- Was the action excluded from the Program?
- Were the effects of the action identifiable at the level of detail being considered for Program analysis?

Facilities meeting all these criteria are:

- Coastal Aqueduct Branch II
- Shasta Temperature Control Device
- Kern Water Bank facilities that were completed and operating as of June 1995
- Los Vaqueros Reservoir Project
- Diamond Valley Reservoir Project
- New Melones Conveyance Project
- Interim Re-Operation of Folsom Reservoir
- Sacramento River Flood Control System Evaluation - Phases II and III
- Semitropic Water Storage District Groundwater Banking Project
- Monterey Agreement
- Stone Lakes National Wildlife Refuge
- Central Valley Habitat Joint Venture Implementation Plan

Hydrology Modeling Assumptions

The hydrology modeling approach (see Section A-3) used to evaluate the effects of CALFED actions assumed that the dedication of water for environmental purposes and delivery of water to refuges per the Central Valley Project Improvement Act (CVPIA) (Section 3406 [b][2] and [d][1] and [2], respectively) were part of existing conditions because they were explicitly implemented upon enactment of the CVPIA and also part of the No Action Alternative conditions because they would continue to be in place in the future, in the absence of CALFED actions.

A.2.2 Non-Physical Facilities and Non-Modeling Assumptions Included in the No Action Alternative

The items in Table A-1 were considered in assessing the consequences of the No Action Alternative and Program Alternatives.

A.3 MODELING APPROACH AND ASSUMPTIONS FOR EXISTING CONDITIONS, THE NO ACTION ALTERNATIVE, AND PROGRAM ALTERNATIVES

Based on the uncertainty of future water management, the Program developed a modeling approach through bookending the potential level of demands and imports, Delta regulatory requirements, and new storage facilities. This approach provides an effective means to fully evaluate the environmental consequences of the No Action Alternative and Program alternatives.

A.3.1 Approach

The DWRSIM model was used to programmatically evaluate the effects of adding new facilities and changing existing facilities operating criteria on Central Valley flows, existing and new reservoir storage operations, Delta exports and outflow, and required water acquisition quantities.

The model was also used to assess changes in water deliveries to south-of-Delta SWP and CVP water users resulting from Program implementation. Water supply reliability was assessed relative to the degree and frequency at which the facilities with the varying alternatives, managed with associated operations criteria, are able to meet future water demands. These demands include municipal, industrial, agricultural, environmental, power production, aesthetic, and recreational water needs. Specific beneficiaries and willingness of beneficiaries to pay for new facilities, will not be determined until later stages of the Program. For this analysis, SWP and CVP water users were used in the assessment as surrogates for all potential water supply beneficiaries.

Assumptions regarding allocation of new storage capacity between agricultural, urban, and environmental beneficial uses are hypothetical and provided only for modeling purposes. Decisions about how to allocate potential benefits will be made based on several factors including the willingness of users to pay for new storage or conveyance facilities, operational opportunities and constraints associated with new storage or conveyance facilities, and environmental requirements associated with new storage or conveyance facilities.

Table A-1. Non-Physical Facilities and Non-Modeling Assumptions Included in the No Action Alternative

ITEM	EXISTING CONDITIONS	NO ACTION ALTERNATIVE
Land retirement[1]	Assumes no land retirement	Assumes 45,000 acres retired by 2020 according to the California Department of Water Resources (DWR) Bulletin 160-93
Groundwater regulations[2]	Assumes existing regulations and policies	Same as existing conditions
Flood control policies[3]	Assumes existing policies	Same as existing conditions
Population estimates[4]	California Department of Finance projections for 1995	California Department of Finance projections for 2020
Drinking water regulations[5]	Assumes existing regulations	Same as existing conditions
Endangered species listings[6]	Assumes current listings	Same as existing conditions
Water conservation[7]	Assumes levels noted in DWR Bulletin 160-93	Assumes levels noted in the discussion below
Power production[8]	Assumes that power is produced incidental to other operations	Same as existing conditions

Notes:

[1] Land Retirement refers to a program to remove acreage on the west side of the San Joaquin Valley from cultivation because of drainage problems. The Program does not use land retirement as a tool to increase water supply.

[2] Groundwater policies refer to state and local policies regarding the management of groundwater resources.

[3] Flood control refers broadly to flood control practices and policies at existing reservoirs.

[4] Population estimates refer to estimates made by the California Department of Finance.

[5] Drinking water regulations refer to current drinking water policies and regulations that affect water treatment regulations.

[6] The Program recognizes that additional species might be listed prior to 2020. However, it is uncertain how the CVP or SWP would be operated if new species are listed and what the modeling assumptions would be if new species are listed. Rather than speculate about project operation changes and modeling assumptions, the Program assumed that current listings and biological opinions would drive project operations and modeling. In the future, when new species are listed and biological opinions rendered, these requirements will be taken into account when describing the consequences of proposed actions.

[7] Based on analysis provided in the Water Use Efficiency Program Plan. See the "Summary of 2020 Estimated Conservation and Recycling Potential" table for estimates of potential reduction of water application and irrecoverable losses. Values in the summary table represent potential reductions of water application and irrecoverable losses that are most likely to occur for future conditions regardless of the outcome of a Program solution (termed no action), as well as the incremental savings expected from a Program solution. Representative values shown in the summary table are all midpoints in value ranges contained in the Water Use Efficiency Program Plan Appendix.

The purpose of the summary table is to provide a perspective of the order of magnitude of the potential effects of water use efficiency improvements both with and without the Program solution. The values presented are not goals or targets. Rather, they are intended to provide the relative magnitude of potential results of expected efficiency actions. Because stakeholders disagree on the magnitude or the feasibility of achieving these values, the values will be further refined before the CALFED Bay-Delta Program Programmatic EIS/EIR is finalized. Stakeholders do agree, however, that water conservation can provide substantial benefits for multiple purposes and therefore is a significant contribution to the Program solution. Consistent with a programmatic analysis, specific actions or programs that would need to be implemented to achieve these results have not been specified.

The summary table describes three types of potential reductions:

- **Recovered Losses with Potential for Rerouting Flows** - These losses currently return to the water system, either as groundwater recharge, river accretion, or direct reuse. Reduction of these losses would not increase the overall volume of water but might result in other benefits, such as making water available for irrigation or in-stream flows during dry periods, improving water quality, decreasing diversion impacts, or improving flow between the point of diversion and the point of reentry.
- **Potential for Recovering Currently Irrecoverable Losses** - These losses currently flow to a salt sink, deep aquifer, or the atmosphere, and are unavailable for reuse. Reduction of these losses would increase the volume of useable water.
- **Total Potential Reduction of Application** - This is the sum of the previous reductions.

Table A-1. Non-Physical Facilities and Non-Modeling Assumptions Included in the No Action Alternative (continued)

Footnote 7 (continued)

There appears to be emerging agreement between agricultural and environmental interests on distinctions between different types of potential reductions. This is a significant breakthrough in the debate over agricultural water conservation potential, as it enables the Program and stakeholders to focus on effectively reducing specific types of losses in order to obtain desired benefits.

With respect to urban and agricultural water conservation, the Program proposes to rely largely on locally directed processes to provide endorsement or certification of urban and agricultural water suppliers that are properly analyzing conservation measures and are implementing all cost-effective and feasible measures. Organizations composed of water suppliers and public interest or environmental groups already exist that may be able to serve this function. Endorsement or certification of water suppliers would enable CALFED agencies to target assistance programs and other measures to ensure efficient water use. The agricultural water conservation certification process would operate in the context of measurable objectives established through the strategic planning process described below and an assurance package.

Summary of 2020 Estimated Conservation and Recycling Potential (TAF)

	No Action Alternative (Without the Program)			Calfed Increment (Result of Program Actions)			Total Conservation Potential		
	Recovered Losses with Potential for Rerouting Flows (A=C-B)‡	Potential for Recovering Currently Irrecoverable Losses (B)‡	Total Potential Reduction of Application (C)‡	Recovered Losses with Potential for Rerouting Flows (A=C-B)‡	Potential for Recovering Currently Irrecoverable Losses (B)‡	Total Potential Reduction of Application (C)‡	Recovered Losses with Potential for Rerouting Flows (A=C-B)‡	Potential for Recovering Currently Irrecoverable Losses (B)‡	Total Potential Reduction of Application (C)‡
Urban (Total delivered water: 12.0 MAF)	397	530	927	355	680	1,035	752	1,210	1,962
Agricultural (Total applied water: 31.5 MAF)	2,235	220	2,457	1,676	165	1,841	3,911	385	4,299
Urban Recycling†	55	455	510	188	567	755	243	1,022	1,265
TOTAL	2,687	1,205	3,894	2,219	1,412	3,631	4,906	2,617	7,526

† No Action Alternative urban recycling values do not include the existing recycling level of 485 TAF (the March 1998 Phase II Interim Report inadvertently included the existing values).

‡ The values in Column B (Potential for Recovering Currently Irrecoverable Losses) and Column C (Total Potential Reduction of Application) were computed explicitly from regional values of applied water, depletion, evapotranspiration of applied water, and other factors. The values in Column A (Recovered Losses with Potential for Rerouting Flows) were computed as the difference between the values in Columns B and C.

Note:
All figures are forecast for 2020 and are from the Water Use Efficiency Program Plan Appendix.

[8] Power production refers to model assumptions related to CVP and SWP water releases for power production.

A.3.2 MODELING TOOLS

Both qualitative and quantitative methods were used to assess the potential impacts of the Program alternatives on water supply and management. In general, qualitative methods were used to assess impacts from implementation of the Ecosystem Restoration, Water Quality, Levee System Integrity, Water Use Efficiency, Water Transfer, and Watershed Programs. Qualitative methods also were used to assess the impacts of some aspects of the storage and conveyance features of the Program alternatives, including in-Delta storage (see Section 2.1.2). Because of availability of appropriate models, quantitative methods were used to assess impacts of other aspects of the storage and conveyance features of the Program alternatives.

Hydrology Development Process

DWRSIM is a planning model used to simulate the CVP and SWP systems of reservoir and conveyance facilities. The model calculates flows on a monthly time step, using a historical 73-year hydrologic sequence (water years 1922-94). Historical runoff patterns have been normalized to reflect 1995-level and 2020-level land use. This normalization process—or hydrology development process—results in hydrology inputs to DWRSIM that are representative of the water supply available to the CALFED study area under existing conditions (1995 level) and future conditions (2020 level). The No Action Alternative and all Program alternatives assume 2020-level conditions.

As part of the hydrology development process, the Sacramento River Region is divided into drainage and service areas from which water supplies and demands can be more easily evaluated. (San Joaquin River Region hydrology is based on maximum historical water use as determined by Reclamation.) These individual areas are called "depletion study areas." Three steps are conducted in sequence within the hydrology development process:

- Consumptive use studies evaluate water use by depletion area, using historical and projected agricultural and urban land use, evapotranspiration rates, precipitation rates, and soil moisture storage criteria. Projected agricultural and urban land use is based on DWR's Bulletin 160-98. Output from the consumptive use studies become input to the depletion analysis.

- Depletion analysis studies evaluate the effect of future water demands and future storage and diversion regulation on the historical flows of the river systems tributary to the Delta. Future depletion area outflows are computed by adjusting the historical outflow for any changes in water use occurring upstream.

- Preparing input to DWRSIM is the final step in the hydrology development process. Consumptive use and depletion analysis data are converted to local inflows and diversions for the control points in the DWRSIM network.

The hydrology development process imposes 25 or 50% deficiencies on full upstream CVP/SWP project demands during dry and critical water years. Upstream water demands that are not met through CVP/SWP project deliveries are assumed to be met through locally derived water supplies. Details on the hydrology development process are documented in a July 1994 DWR memorandum report entitled

"Summary of Hydrologies at the 1990, 1995, 2000, 2010, and 2020 Levels of Development for Use in DWRSIM Planning Studies."

A key outcome of the hydrology development process is that all upstream water demands are met through CVP/SWP project deliveries or through locally derived water supplies. Consequently, the modeling approach assumes that water supply reliability in the Sacramento River and San Joaquin River Regions remains unchanged under all conditions— existing conditions, No Action Alternative, and all Program alternatives.

Project Operations Modeling

DWRSIM is designed to simulate operation of the CVP and SWP systems for the purposes of water supply, flood control, recreation, in-stream flows, power generation, and Delta water quality and outflow requirements. The model is used to analyze the potential effects of proposed new features, such as additional reservoir storage or Delta export conveyance, as well as any changes to criteria controlling project operations.

To evaluate the various Program alternatives using DWRSIM, new facilities and operational assumptions are assigned to the CVP and SWP. For this programmatic-level evaluation, impacts are evaluated and discussed relative to Program regions rather than specific water project.

Model results provide information on expected reservoir storage, river flow, Delta inflows, Delta outflow, exports, and water project deliveries. Project water deliveries are assumed to have priority access to available capacity of facilities. This analysis does not analyze potential operational changes of non-project facilities with the Central Valley system. In addition to DWRSIM, electronic spreadsheet models and other analytical tools were used for the analyses. The monthly flows calculated by DWRSIM for the Sacramento River and for the San Joaquin River are used as input for Delta hydrodynamic and water quality modeling.

Bay-Delta Hydrodynamic and Water Quality Modeling

The hydrodynamic model, DSM2, simulates the channel flows, tidal effects, and water quality of the Bay-Delta estuary. For the purposes of this programmatic analysis, model simulations were conducted for a 16-year historical hydrologic sequence (water years 1976-91). This period was selected to cover a broad range of Delta inflows and exports, and is generally representative of the 73-year historical hydrologic sequence used in DWRSIM.

A great number of variables must be simulated to describe flows in the Delta. The Delta is a network of interconnected channels. The water flowing in these channels is acted upon by a number of competing forces. Fresh water enters the Delta from tributary streams, including but not limited to the Sacramento, San Joaquin, Mokelumne, and Calaveras Rivers. During much of the year, these Delta inflows are largely controlled by upstream reservoir operations.

Another influence on the flow of water in Delta channels is tidal action. Tidal inflows move water into portions of the Delta where fresh-water flows and channel geometry offer the least resistance. The

relatively large fresh-water inflows from the Sacramento River have the capacity to resist tidal inflows more than the smaller inflows from the San Joaquin River. Combined with pumping in the south Delta, saline Bay water tends to move further into the south Delta than it does into the north Delta. The pattern of flows is continually changing as a result of these competing forces, making it difficult to describe the dominant patterns.

Salinity is an indirect measure of hydrodynamic conditions in the Delta. Delta salinity is primarily a result of sea-water intrusion, although upstream sources, such as agricultural drainage from the San Joaquin Valley, contribute to Delta salinity. X2 is a measure that describes Delta salinity resulting from hydrodynamic conditions. X2 is the distance upstream from the Golden Gate Bridge (in kilometers) at which the mixing of fresh water from the Delta inflow and salt water from the Bay results in a channel bottom salinity of two parts per thousand. Changes in these variables are used in this programmatic analysis to describe the effects of Program actions on hydrodynamic conditions in the Delta.

Uncertainty

The Program recognizes the need to address uncertainty in its assessment of Program alternatives. Project operations modeling and Delta hydrodynamic modeling rely on the formulation of reasonable assumptions to accurately reflect the consequences of present and future water management decisions. The use of different assumptions may lead to conclusions that overestimate or underestimate the impact or benefits of implementing the various Program elements. The modeling assumptions with the greatest uncertainty include future water demands and future environmental water requirements, as discussed in Section 5.1.2.

The Program has begun the formulation of a comprehensive water management strategy to determine the appropriate role of various water management tools in meeting Program objectives. Different combinations of tools may be appropriate, depending on future population growth, land use changes, technological improvements, willingness to pay for improved water supply reliability, and environmental water requirements. These factors can affect the level of future demands on the Bay-Delta system. To aid in developing a water management strategy, the Program has undertaken an economic evaluation of water management alternatives. The Program is performing economic assessments to identify cost-effective combinations of strategies (for example, conservation, recycling, transfers, and new facilities) that meet the Program's water supply reliability objectives. This study effort will help to quantify the uncertainty and risk associated with alternative water management strategies.

At present, a high level of uncertainty is associated with future environmental water requirements. Through the development of an Environmental Water Account (EWA), the Program intends to provide flexibility in achieving environmental benefits while reducing uncertainties associated with environmental water requirements. Flexible management of water operations could achieve fishery and ecosystem benefits more efficiently than a fully prescriptive regulatory approach. The Program believes that operations using an EWA can achieve substantial fish recovery while allowing for continuous improvement in water supply reliability and water quality. A variety of potential approaches are available to define and operate an EWA. Although an EWA has significant potential, a number of major issues and details must be resolved before this approach can be fully implemented. These include:

- Determine which environmental protections would be provided through prescriptive standards and which would be provided through an EWA.

- Investigate various approaches for implementing an EWA.
- Develop accounting methodologies.
- Determine the reliability of existing legal mechanisms to assure intended use of EWA water released for in-stream purposes.
- Determine how much existing surface and groundwater storage, water purchase contract water, and water generated from conservation and recycling projects would be needed by an EWA.

To fully describe potential consequences of Program actions, CALFED has incorporated a reasonable range of uncertainty into this programmatic analysis. This range of uncertainty was quantified by formulating two distinct "bookend" water management criteria assumption sets. These two sets of assumptions, referred to as Criteria A and B, serve as boundaries for a range of possible Delta inflow, export, and outflow patterns in this programmatic analysis. The primary assumptions that differentiate the bookend assumption sets from each other and from existing conditions are Bay-Delta system water demands and various Delta management criteria that regulate system operations. Figure A-1 reflects the framework for evaluating the No Action Alternative and Program alternatives.

The range of water demands defined by these water management criteria assumption sets represents uncertainty in the future need for Bay-Delta water supplies due to population growth, land use changes, implementation of water use efficiency measures, and water marketing. Criterion A assumes current Bay-Delta system demands apply throughout the Program planning horizon. Under this assumption, any future increase in demands in the Program study area would be met by alternative supply or demand management options. In contrast, Criterion B assumes a future increase of about 10% in Bay-Delta system demands. SWP demands vary annually from 3.6 to 4.2 million acre-feet (MAF), and CVP demands are 3.5 MAF per year using this criterion.

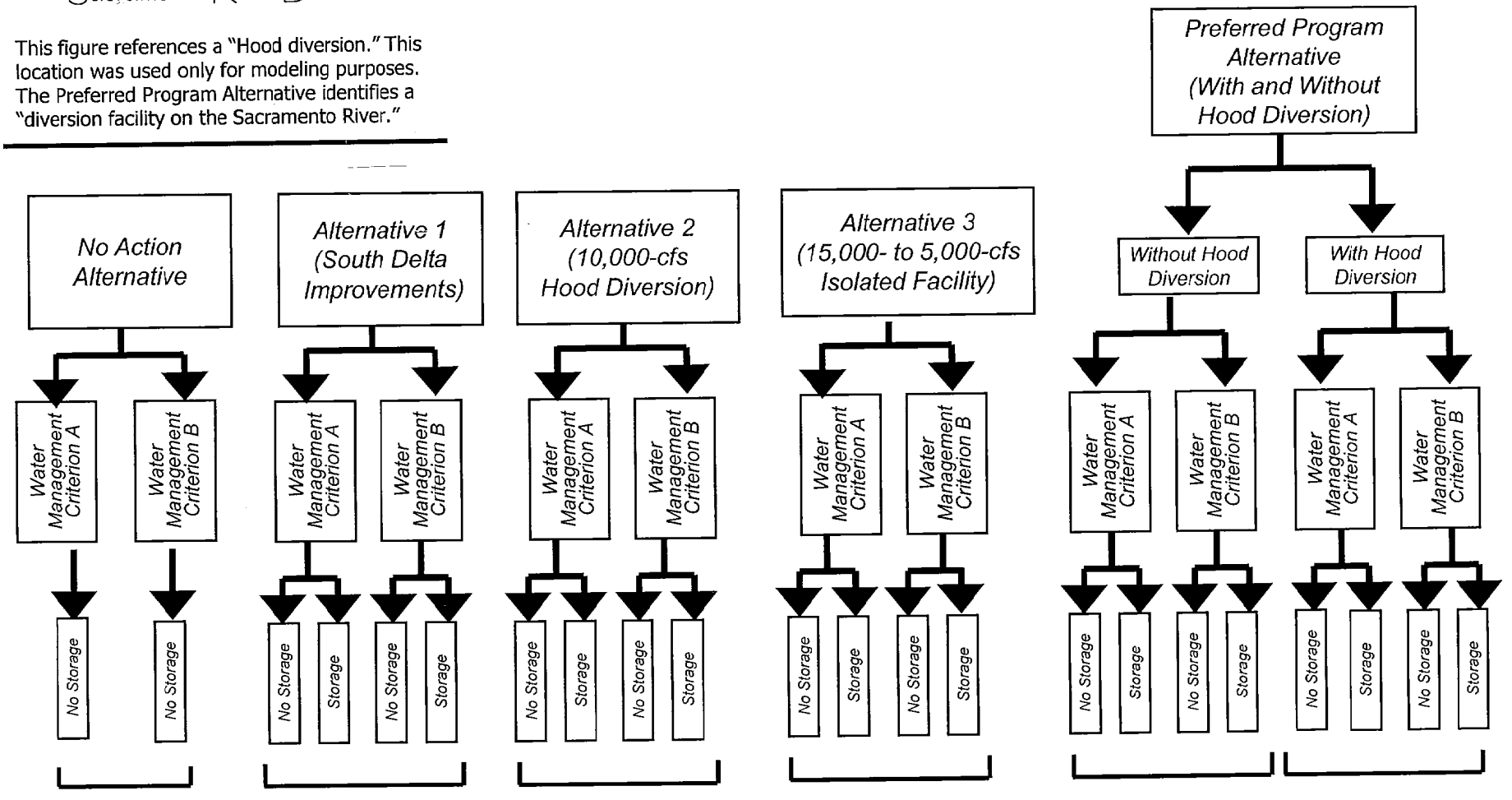
The range of Delta water management criteria represents uncertainty related to future environmental water requirements. Under Criterion A, CVP and SWP facilities are operated to meet additional prescriptive Delta actions above the existing conditions operation criteria (described under "Modeling Assumptions"). While specific assumptions regarding Delta water management criteria were made to complete the water simulation modeling, the Program's intention is to depict a general level of environmental protection. These assumptions should not be interpreted as specific predictions of future regulatory actions. Under Criterion B, only existing prescriptive Delta actions are applied.

Ranges also were used to describe possible flow changes in the Trinity and American Rivers due to the Trinity River Flow Analysis Study and implementation of the EBMUD CVP contract (described under "Modeling Assumptions"). These activities could result in changes in the availability of water to meet Program objectives. The assumed ranges were included in the No Action Alternative assumptions to help decision makers better understand the potential consequences of the Program. No decisions have been made about the Trinity River flows or American River diversions.

Figure A-1. Assessment Approach for the CALFED Programmatic EIS/EIR

Sacramento River Diversion

This figure references a "Hood diversion." This location was used only for modeling purposes. The Preferred Program Alternative identifies a "diversion facility on the Sacramento River."



The CVPIA is included in the description of existing conditions and in the analyses of the No Action Alternative and Program alternatives in this programmatic evaluation. Section 3406(b)(2) of the CVPIA mandates that the Secretary of Interior dedicate and manage 800 TAF of CVP yield for the primary purpose of implementing fish, wildlife, and habitat restoration measures. Considerable controversy has surrounded interpretation and implementation of this provision. In November 1997, Interior issued its "Final Administrative Proposal on the Management of Section 3406(b)(2) Water," which described Interior's plan to comply with this provision. This Final Administrative Proposal provided the basis for the assumptions regarding implementation of CVPIA Section 3406(b)(2) used in the analysis of alternatives included in this programmatic evaluation.

A legal challenge to Interior's interpretation of CVPIA Section 3406(b)(2) followed the release of the Final Administrative Proposal. The controversy centered on Interior's method of accounting for CVP yield for Section 3406 (b)(2) purposes. In response to a preliminary injunction issued by U.S. District Court Judge Oliver W. Wanger, Interior prepared and released the "Interim Decision on Implementation of Section 3406(b)(2) of the Central Valley Project Improvement Act" on July 14, 1999. This was followed by issuance of a "Final Decision on Implementation of Section 3406(b)(2) of the Central Valley Project Improvement Act" on October 6, 1999. The Final Decision describes the accounting methodology that Interior intends to use to determine the extent of restoration measures that will be implemented under CVPIA Section 3406 (b)(2). As described in the Final Decision, while Interior maintains broad discretion in determining what measures will be implemented, an annual accounting will be used to ensure that 800 TAF of CVP yield is dedicated to restoration actions each year.

In a March 2000 ruling that dissolved the preliminary injunction, Judge Wanger upheld Interior's method of accounting for CVP yield for the 1999-2000 water year in the Interim Decision, with some modification regarding flows in the American River. Plaintiffs have filed an amended complaint, challenging the Final Decision, and may choose to appeal Judge Wanger's order on the Interim Decision. Moreover, the State of California currently is working with Interior to determine how SWP facilities will be operated during implementation of CVPIA Section 3406 (b)(2) restoration measures. For these reasons, it is unclear how CVPIA Section 3406(b)(2) ultimately will be interpreted. While general effects of CVPIA Section 3406 (b)(2) restoration actions are included in this programmatic evaluation, based on the November 1997 Final Administrative Proposal, some specific effects could vary in the future as the details of implementing CVPIA Section 3406 (b)(2) are determined. This variable, however, does not present an insurmountable obstacle for this programmatic evaluation.

The No Action Alternative and the Program alternatives were evaluated with a range of operating assumptions to consider uncertainty in future Bay-Delta system water demands and environmental water requirements. The range of uncertainty is bounded by two distinct bookend water management criteria assumption sets (Criteria A and B). The provisions of Interior's November 1997 Final Administrative Proposal are included as operational assumptions in both of these bookend assumption sets. The Criterion A assumption set defines the highest environmental water requirements and lowest Delta exports considered in this analysis. Ecosystem protections provided in Criterion A exceed those included in the 1994 Bay-Delta Accord and the November 1997 Final Administrative Proposal interpretation of CVPIA Section 3406(b)(2). CALFED does not anticipate that future changes in interpretation of Section 3406(b)(2) will result in higher environmental water requirements or lower Delta export conditions than those described by the Criterion A assumption set. At the opposite end of the range of uncertainty, the Criterion B assumption set defines the lowest environmental water requirements and highest Delta exports

considered in this analysis. Again, CALFED does not anticipate that a revised interpretation of Section 3406(b)(2) will result in a lower environmental water requirement or a higher Delta export condition than provided in the Criterion B assumption set. Some exceptions to these expected effects of CVPIA Section 3406(b)(2) could occur; some specific parameter may vary outside the ranges evaluated in this programmatic evaluation during some specific water-year type. However, these potential differences would be consistent for all alternatives and are not expected to significantly change the magnitude of projected impacts. Table A-2 summarizes the modeling assumptions.

A.3.3 MODELING ASSUMPTIONS

A summary description of the Program alternative assumptions is provided in Table A-2. The table also provides a description of Delta modifications and storage components associated with each alternative. These assumptions and Program alternative configurations are the foundation of the DWRSIM and DSM2 assessments, which provide quantitative information used by several resource areas for impact evaluations of the Program alternatives. In some instances, assumptions are required for modeling purposes that incorporate more detail than needed for this programmatic evaluation. An example of this level of detail is the specific location of storage and conveyance facilities. These detailed modeling assumptions are disclosed in this section to describe the analytical processes employed in this evaluation; these assumptions are not intended to imply the outcome of future project-specific decisions.

Modeling Assumptions for Existing Conditions

The major assumptions used for modeling existing conditions are listed below:

- **1995-Level Hydrology**. A 1995-level hydrology, HYD-D06E, is used. The 1995-level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections.

- **SWP Demands**. South-of-Delta SWP demands are varied between 3,529 TAF in drier years down to 2,644 TAF in wetter years, based on local wetness indices. SWP demands of San Joaquin Valley agricultural contractors are reduced in wetter years from 1,150 to 915 TAF, using a Kern River flow index. SWP demands of the Metropolitan Water District of Southern California (MWD) are reduced in wetter years from 1,433 to 783 TAF, using a southern California precipitation index. Deliveries to all other SWP municipal and industrial (M&I) Contractors are not adjusted for a wetness index, and are set at 882 TAF in all years.

- **CVP Demands**. South-of-Delta CVP demands, including wildlife refuges, are set at 3,433 TAF/ year. CVP demands in certain wet years (in the San Joaquin River basin), are met from the Mendota Pool when James Bypass flows are available in the Mendota Pool. Level 2 refuge demands in the San Joaquin Valley are explicitly modeled at an assumed level of 288 TAF/year as defined in Reclamation's March 1989 "Report on Refuge Water Supply Investigation." Wildlife refuge demands in the Sacramento Valley are modeled explicitly at 124 TAF/year and implicitly at 75 TAF/year, for a total Sacramento Valley Level 2 refuge demand of 199 TAF/year.

- **In-Stream Requirements**

Sacramento River. Sacramento River navigation control point (NCP) flows are maintained at 5,000 cfs in wet and above-normal water years and 4,000 cfs in all other years, with possible relaxations to 3,250 cfs. Flow objectives between 3,250 and 6,000 cfs are maintained below Keswick Dam on the Sacramento River in accordance with the CVPIA flow criteria, as defined in Interior's November 20, 1997 CVPIA administrative proposal. Flow objectives for Clear Creek also are based on the November 20, 1997 document. Shasta Reservoir carryover storage is maintained at or above 1.9 MAF in all normal water years for winter-run salmon protection per the National Marine Fisheries Service (NMFS) biological opinion. However, in critical years following critical years, storage is allowed to fall below 1.9 MAF.

Feather River. Feather River fishery flows are maintained per an agreement between DWR and the California Department of Fish and Game (DFG) (August 26, 1983), with minimum flows of 1,700 cfs for October through March and 1,000 cfs from April through September.

Yuba River. Yuba River minimum fishery flows below Englebright Reservoir at Smartville range between 600 and 800 cfs from October 15 through February under 1993 Federal Energy Regulatory Commission (FERC) requirements. The river flows are not dynamically modeled by the DWRSIM model but are contained in the HYD-D06E hydrology used as model input into DWRSIM.

American River. Flow objectives between 250 and 4,500 cfs are maintained below Nimbus Dam on the American River as defined in Interior's November 20, 1997 CVPIA administrative proposal.

Mokelumne River. Mokelumne River minimum fishery flows below Camanche Dam are per an agreement between EBMUD, U.S. Fish and Wildlife Service (USFWS), and DFG (FERC Agreement 2916), with base flows ranging from 100 to 325 cfs from October through June and at 100 cfs from July through September. The river flows are not dynamically modeled by the DWRSIM model but are contained in the HYD-D06E hydrology used as model input into DWRSIM.

Stanislaus River. Stanislaus River flows below New Melones Reservoir are according to the New Melones interim operation plan.

Tuolumne River. Tuolumne River minimum fishery flows below New Don Pedro Dam are maintained between 50 and 300 cfs per an agreement between Turlock and Modesto Irrigation Districts, City of San Francisco, DFG, and others (FERC Agreement 2299). The Tuolumne River pulse flow requirements per the FERC agreement have been modeled to coincide with VAMP flows during the April and May pulse period.

Merced River. Merced River minimum fishery flows below Shaffer Bridge are maintained between 15 and 180 cfs per an agreement between Merced Irrigation District, DFG, and others (FERC, Davis-Grunsky).

San Joaquin River. Flows according to the VAMP agreement have been incorporated into the modeling of the San Joaquin River.

Table A-2. Summary of Modeling Assumptions

Alternative Configuration		Operation Criteria					Delta Modifications				Storage Components (Maximum Storage Volumes in MAF)					DWRSIM Study	DWRDSM2 Study
		Baseline Operation Criteria	Water Management Criteria	South Delta Criteria	North Delta Hood Diversion	Isolated Facility Criteria	CVP-SWP Improvements	North Delta Channel	South Delta Modifications	Isolated Conveyance/ Hood Facility (Conveyance Capacity in 1,000 cfs/Type)	Sacramento Valley Groundwater Storage	Upstream Surface Storage Sacramento River Tributaries	Upstream Surface Storage San Joaquin River Tributaries	San Joaquin Valley Groundwater Storage	South of Delta Aqueduct Surface Storage		
Exist. Cond.		1														771	1EX
No Action		1	A													785	1A-A
		1	B													786	1A-B
Alternative 1		1	A	1			1		1,2,3							789	1C-A
		1	A	1			1		1,2,3		0.25	3.0	0.25	0.5	2.0	808	
		1	B	2			1		1,2,3							809	
		1	B	2			1		1,2,3		0.25	3.0	0.25	0.5	2.0	801	1C-BS
Alternative 2		1	A	1	1		1	1,4	1,2,3							790	2B-A
		1	A	1	1		1	1,4	1,2,3		0.25	3.0	0.25	0.5	2.0	810	
		1	B	2	2		1	1,4	1,2,3							811	
		1	B	2	2		1	1,4	1,2,3		0.25	3.0	0.25	0.5	2.0	803	2B-BS
Alternative 3	15K IF	1	A	2		1,3	1	4		15						804	3E-A
		1	A	2		1,3	1	4		15	0.25	3.0	0.25	0.5	2.0	812	
	5k IF	1	B	2		2	1	4	1,2,3	5						820	
		1	B	2		2	1	4	1,2,3	5	0.25	3.0	0.25	0.5	2.0	791	3B-BS
Preferred Program Alternative	w/o Hood Diversion	1	A	1			1		1,2,3							789	1C-A
		1	A	1			1		1,2,3		0.25	3.0	0.25	0.5	2.0	808	
		1	B	2			1		1,2,3							809	
		1	B	2			1		1,2,3		0.25	3.0	0.25	0.5	2.0	801	1C-BS
	w/ Hood Diversion	1	A	1	1		1	2	1,2,3							793	2P-A
		1	A	1	1		1	2	1,2,3		0.25	3.0	0.25	0.5	2.0	821	
		1	B	2	2		1	3,4	1,2,3							822	
		1	B	2	2		1	3,4	1,2,3		0.25	3.0	0.25	0.5	2.0	792	2P-BS

Please refer to the notes on the following page.

Table A-2. Summary of Modeling Assumptions (continued)

OPERATION CRITERIA

Baseline Operation Criteria

1 1995-level hydrology and demands are assumed. South-of-Delta SWP demands vary between 3.5 MAF in drier years down to 2.6 MAF in wetter years based on local wetness indices. Annual south-of-Delta CVP demands are 3.4 MAF. CVP and SWP facilities are operated to meet the SWRCB May 1995 Water Quality Control Plan for the Bay-Delta (WQCP); the facilities are also operated to meet the CVPIA (b) (2) Delta actions. Trinity River minimum flows below Lewiston Dam are maintained at 340 TAF in all years.

Water Management Criteria

A 2020-level hydrology and 1995-level demands are assumed. CVP and SWP facilities are operated to meet additional prescriptive Delta actions above the baseline operation criteria. Trinity River minimum flows below Lewiston Dam are as defined per U.S. Bureau of Reclamation (Reclamation) Draft CVPIA PEIS. EBMUD American River diversions at Fairbairn are assumed as defined in the EBMUD Supplemental Water Supply Project (maximum 115 TAF per year).

B 2020-level hydrology and demands are assumed. SWP demands vary annually from 3.6 to 4.2 MAF. CVP demands are 3.5 MAF per year.

South Delta Criteria

1 Full and unlimited joint point of diversion (JPD) is assumed. Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant) capacity is 10,300 cubic feet per second (cfs); actual pumping is constrained in accordance with 1981 U.S. Army Corps of Engineers (Corps) criteria.

2 Full and unlimited JPD is assumed. Banks Pumping Plant capacity is 10,300 cfs.

North Delta Criteria

1 Hood diversions are limited to: (a) 50% of south Delta exports; (b) 5,000 cfs in May; (c) 35% of Sacramento flow in March and June, and 15% in April and May. Rio Vista flow criteria of 3,000 cfs in July and August are maintained. Delta Cross Channel (DCC) gates are closed for all months, except in June for dry, critical, and below-normal water-year types.

2 Hood diversions are limited to: (a) 100% of the south-of-Delta exports, and (b) 5,000 cfs in May. Rio Vista flow criteria of 3,000 cfs are maintained. DCC gates are closed, except for July and August.

Isolated Facility Criteria

1 Isolated facility diversions are limited to 5,000 cfs in May. Minimum through-Delta conveyance is 1,000 cfs from October-March and July-September. Rio Vista flow criteria of 3,000 cfs are maintained. DCC gates are closed, except June (in dry, critical, and below-normal water years), and July and August (in all water years). The isolated facility conveyance is included in export restrictions.

2 Isolated facility diversions are limited to: (a) 5,000 cfs in May, and (b) 35% of Sacramento flow in March and June, and 15% in April-May. Minimum through-Delta conveyance is 1,000 cfs from October-March and July-September. Rio Vista flow criteria of 3,000 cfs are assumed. DCC gates are closed, except for July and August. The isolated facility conveyance is not included in export restrictions.

3 Level II Delta agriculture diversions are delivered from the Isolated Facility.

DELTA MODIFICATIONS

CVP and SWP Improvements

1 New fish screens operate at the Skinner Fish Facility and Tracy Pumping Plant intake. Interconnection between Tracy Pumping Plant and CCFB is assumed.

North Delta Modifications

1 A 10,000-cfs screened Hood intake is operational.

2 A 2,000-cfs screened Hood intake is operational.

3 A 4,000-cfs screened Hood intake is operational.

4 A 600-foot-wide alignment is assumed along the Mokelumne River from I-5 to the San Joaquin River.

South Delta Modifications

1 Increased permitted capacity of existing export pumps to physical capacity is assumed. A new CCFB intake structure is operational. An operable barrier (or equivalent) is installed at the head of Old River to maintain a positive flow down the San Joaquin River.

2 Flow and stage control structures (or equivalent) are installed on Middle River, Grant Line Canal, and Old River to control flow, stage, and south Delta salinity.

3 Channel enlargement along a 4.9-mile reach of Old River is assumed.

- **Delta Standards.** Operation of CVP and SWP Delta export facilities are coordinated with upstream reservoirs to meet the State Water Resources Control Board's (SWRCB's) May 1995 WQCP. Select CVPIA (b)(2) Delta Actions are also assumed. These assumptions are summarized below.

  Export Limits. Ratios for maximum allowable Delta exports are specified as a percentage of total Delta inflow, as shown in Table A-3. In February, the export ratio is a function of the January Eight River Index.

Table A-3. Export/Import Ratio (in %)

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
65	65	65	65	35-45	35	35	35	35	65	65	65

Based on the WQCP, April 15 to May 15 total Delta exports are limited to 1,500 cfs or 100% of the San Joaquin River flow at Vernalis, whichever is greater. Additional water is provided from the San Joaquin River upstream of its confluence with the Stanislaus River, if necessary, to meet salinity and pulse flow objectives at Vernalis. Additional water requirements are shared equally between the Tuolumne (New Don Pedro Reservoir) and Merced (Lake McClure) River basins. If these sources are insufficient to meet objectives at Vernalis, nominal deficiencies are applied to upstream demands. Additional releases from the Tuolumne and Merced Rivers are assumed to be of fresh-water quality (50 milligrams per liter [mg/L] total dissolved solids [TDS]). Furthermore, it is assumed that these additional releases do not incur losses between the reservoirs and Vernalis.

X2 Requirement. For February through June, outflow requirements are maintained in accordance with the WQCP's 2.64 electrical conductivity (EC, an index of salinity) criteria (also known as X2), using the required number of days at Chipps Island and Roe Island. Additional days are assumed in accordance with CVPIA (b)(2) Delta Actions (see below).

Water Quality Objectives. The water quality objective at Contra Costa Canal intake is maintained in accordance with the WQCP. A buffer was added to ensure that the chloride standard is maintained on a daily basis. Thus, DWRSIM uses maximum values of 130 mg/L for the 150-mg/L standard and a value of 225 mg/L for the 250-mg/L standard.

Water quality objectives on the Sacramento River at Emmaton and on the San Joaquin River at Jersey Point are maintained in accordance with the WQCP. Water quality objectives on the San Joaquin River at Vernalis are 0.7 μmhos/cm. EC in April through August and 1.0 μmhos/cm EC in other months. These objectives are maintained primarily by releasing water from New Melones Reservoir. A cap on water quality releases is imposed per criteria outlined in an April 26, 1996 letter from Reclamation to SWRCB. The cap varies between 70 and 200 TAF/year, depending on New Melones storage and projected inflow. The interior Delta standards on the Mokelumne River (at Terminous) and on the San Joaquin River (at San Andreas Landing) are not modeled.

The 0.44-μmhos/cm EC standard is maintained at Jersey Point in April and May of all but critical

years. This criterion is dropped in May if the projected Sacramento River Index is less than 8.1 MAF. Table A-4 displays average high-tide EC standards to be maintained at Collinsville for eastern Suisun Marsh salinity control. All other Suisun Marsh standards are assumed to be met through operation of the Suisun Marsh salinity control gates.

CVPIA Section 3406(b)(2) Delta Actions. The following Delta actions are maintained in accordance

Table A-4. EC Standards at Collinsville (in μmhos/cm)

OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY
19.0	15.5	12.5	12.5	8.0	8.0	11.0	11.0

with Interior's November 20, 1997 "Final Administrative Proposal on the Management of Section 3406(b)(2) Water" (see Section 5.1.4.2 for a description of recent U.S. District Court decisions on CVPIA Section 3406[b][2] and effects on this programmatic evaluation):

- Action 1 - Maintain VAMP flows.
- Action 3 - Maintain Chipps Island X2 days from March-June at 1962 level of development.
- Action 4 - Maintain Sacramento River flow at Freeport from 9,000 to 15,000 cfs.
- Action 5 - Ramp Delta exports following the pulse flow period.
- Action 6 - Close DCC gates from October-January for all water-year types.
- Action 7 - Maintain July flow and exports based on June X2 position.

Delta Cross Channel Gate Operations. Under the 1995 WQCP, the DCC is closed 10 days in November, 15 days in December, and 20 days in January—for a total closure of 45 days. The DCC is fully closed from February 1 through May 20 of all years and is closed an additional 14 days between May 21 and June 15. In addition, Delta Action 6 under Delta (b)(2) requires that the DCC gates be closed from October through January in all water-year types.

- **Pumping Plant Capacities, Coordinated Operation, and Wheeling**

Banks Pumping Plant. SWP Banks Pumping Plant average monthly capacity with four new pumps is 6,680 cfs (or 8,500 cfs in some winter months), in accordance with the Corp's October 31, 1981 Public Notice criteria. Pumping is limited to 3,000 cfs in May and June, and 4,600 cfs in July to comply with D-1485 criteria for striped bass survival. Additionally, per a January 5, 1987 interim agreement between DWR and DFG, SWP pumping is limited to 2,000 cfs in any May or June in which storage withdrawals from Oroville Reservoir are required.

Tracy Pumping Plant. CVP Tracy Pumping Plant capacity is 4,600 cfs, but constraints along the Delta-Mendota Canal and at the relift pumps (to O'Neill Forebay) can restrict export capacity to as

low as 4,200 cfs. Pumping is limited to 3,000 cfs in May and June in accordance with the 1995 WQCP criteria for striped bass survival.

Coordinated Operation Agreement. CVP/SWP sharing of responsibility for the coordinated operation of the two projects is maintained per the Coordinated Operation Agreement. Storage withdrawals for in-basin use are split 75% CVP and 25% SWP. Unstored flows for storage and export are split 55% CVP and 45% SWP.

Wheeling. Wheeling of CVP water by the SWP to meet Cross Valley Canal demands is not considered for consistency with recent modeling conducted for the SWRCB to support implementation of the 1995 WQCP. The SWRCB considered Cross Valley Canal wheeling for its EIR on implementation of the 1995 WQCP as part of joint points of diversion. The CVP and SWP signed an agreement in 1975 and 1976, where the SWP agreed to wheel water for Cross Valley Canal demands for Kern County Water Agency through 1995.

- **Trinity River Imports.** Trinity River minimum fish flows below Lewiston Dam are maintained at 340 TAF/year for all years, based on a May 1991 letter agreement between Reclamation and the USFWS. Trinity River flows of 340 TAF are also based on Section 3406(b)(23) of the CVPIA.

- **EBMUD American River Diversions.** No EBMUD American River diversions are assumed.

Modeling Assumptions for the No Action Alternative

The No Action Alternative assumptions are comparable to assumptions described above for existing conditions, except for the level of upstream diversions and level of demands and/or additional Delta water management criteria as described here. The No Action Alternative assumptions are organized under two assumption sets: Criteria A and B. This range of criteria provides a variation in Delta exports due to varying system demands and environmental protections.

- **Criterion A**

2020-Level Hydrology. A 2020-level hydrology, HYD-D09C is assumed. The 2020-level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections.

SWP and CVP Demands. South-of-Delta SWP and CVP Bay-Delta system demands are the same as those described for existing conditions. Any future increase in demand due to population growth or land use changes would be met with alternative water management tools.

Delta Environmental Protections. Criterion A assumes the following Delta environmental protections:

- If the January San Joaquin River flow at Vernalis is greater than the upper 25th percentile (about 4,150 cfs), exports are reduced for 10 days in February to 1,100 cfs.

- In February and March, a minimum QWEST of 1,000 cfs is maintained if the January Eight River Index is less than 1.0 MAF. If the January Eight River Index is greater than 1.0 MAF, a minimum QWEST of 0 cfs is maintained.

- A minimum QWEST of 0 cfs is maintained in December and January if the November Four River (San Joaquin River) Index is greater than 1.1 MAF. Additionally, if the December Four River (San Joaquin River) Index is between 0.75 and 1.3 MAF, a minimum QWEST of 0 cfs is maintained in January.

- In April through June, a minimum QWEST of 1,000 cfs is maintained.

- VAMP exports criteria are extended to 61 days in April and May.

Trinity River Imports. Trinity River minimum fish flows below Lewiston Dam are in accordance with Reclamation's Draft CVPIA PEIS (maximum flow requirement 750 TAF/year).

EBMUD American River Diversions. New EBMUD American River diversions at Nimbus Dam are assumed, as defined in the EBMUD Supplemental Water Supply Project (maximum 115 TAF/year).

- **Criterion B**

2020-Level Hydrology. A 2020-level hydrology, HYD-D09C is assumed. The 2020-level of hydrology and upstream depletions are based on DWR Bulletin 160-98 land use projections (73 years: 1922-1994)

SWP Demands. SWP demands are assumed to vary from 3.6 to 4.2 MAF. This corresponds to DWR's Bulletin 160-98 assumptions for 2020-level demand. MWD's monthly demand patterns assume an Diamond Valley Reservoir and an Inland Feeder Pipeline in accordance with a July 26, 1995 memorandum from MWD. Maximum SWP interruptible demand is 134 TAF/month. SWP wheeling for CVP is 128 TAF/month.

CVP Demands. South-of-Delta CVP demands, including wildlife refuges, are set at 3,500 TAF/year. CVP Delta export demands are reduced in certain wet years (in the San Joaquin River basin) when James Bypass flows are available in the Mendota Pool. Level 2 refuge demands in the San Joaquin Valley are explicitly modeled at an assumed level of 288 TAF/year. Level 2 refuge demands in the Sacramento Valley are explicitly modeled at an assumed level of 124.5 TAF/year and implicitly modeled at 75 TAF/year, for a total Sacramento Valley Level 2 refuge demand of 199 TAF/year. The Contra Costa Canal monthly demand pattern assumes Los Vaqueros operations in accordance with a July 11, 1994 e-mail from Contra Costa Water District (CCWD). CVP water is wheeled by the SWP to meet Cross Valley Canal demands of 128 TAF/year.

Modeling Assumptions for the Program Alternatives

Similar to the No Action Alternative assumptions, the Program alternative assumptions are organized under two bookend assumptions sets (Criteria A and B). Additionally, each Program alternative is examined with and without new storage facilities as described below. The Program alternative assumptions are comparable to those described above for existing conditions and the No Action Alternative but also include assumptions related to Ecosystem Restoration Program flow targets, new storage facilities, and Delta conveyance configurations.

- **Ecosystem Restoration Program.** All Program alternatives include the Ecosystem Restoration Program flow targets shown in Table A-5. The Ecosystem Restoration Program water for instream flows and Delta outflow targets are available only for environmental uses. Shortfalls in Ecosystem Restoration Program flow are made up through an "add water" function to simulate acquisitions from willing sellers.

Table A-5. Proposed Ecosystem Restoration Program Flow Targets (cfs)

LOCATION/ TIME PERIOD	CRITICAL	DRY	BELOW NORMAL	ABOVE NORMAL	WET
Delta Outflow					
March - 10 days	-	20,000	30,000	40,000	-
April/May - 10 days	-	20,000	30,000	40,000	-
Sacramento River at Freeport					
May	-	13,000	13,000	13,000	13,000
Sacramento River at Knights Landing					
March - 10 days	-	7,500	17,500	17,500	-
Feather River at Gridley					
March - 10 days	-	5,000	7,000	9,000	-
Yuba River at Marysville					
March - 10 days	-	2,500	3,500	3,500	-
American River at Nimbus Dam					
March - 10 days	-	3,500	5,000	5,000	7,000
Stanislaus River at Goodwin Dam					
April/May - 10 days	-	-	2,750	2,750	3,500
Tuolumne River at La Grange					
April/May - 10 days	-	2,750	3,750	3,750	5,500
Merced River at Shaffer Bridge					
April/May - 10 days	-	1,250	2,250	2,250	3,750

- **Storage.** Each Program alternative is examined with and without new storage facilities under both water management criteria. The total volume of all new storage is 6 MAF and is assumed to be split among the two beneficial use sectors: (1) environmental, and (2) agricultural and urban purposes. The

0- to 6-MAF range of storage is not intended as a conclusion about the optimal amount of storage but is a bookend used in modeling the water supply opportunities of storage.

For environmental purposes, portions of the Sacramento River and the entire San Joaquin River tributary surface storage at 1.0 MAF and 260 TAF, respectively, is operated solely for Ecosystem Restoration Program flow purposes. Groundwater storage and south-of-Delta off-aqueduct surface storage require transfer arrangements to serve Ecosystem Restoration Program flow targets. These types of arrangements are not reflected in the analysis due to limitations of system operation modeling. Environmental storage is operated to maximize average annual yield and does not impose carryover provisions.

For agricultural and urban purposes, the remaining 2.0 MAF of Sacramento River tributary surface storage, 750 TAF of combined groundwater storage, and 2.0 MAF of south-of-Delta off-aqueduct surface storage is operated for CVP/SWP south-of-Delta service areas. Because specific beneficiaries of any potential increased water supply resulting from additional storage will not be identified until later stages of the Program, these CVP and SWP water users are used as a surrogate for all potential water supply beneficiaries. In-Delta storage is not reflected in the analysis due in part to limitations of DWRSIM. DWRSIM uses a monthly time step, which does not accurately reflect the day-to-day decisions necessary for effective operation of in-Delta storage. The impacts associated with potential operating assumptions for in-Delta storage reservoirs were assessed qualitatively for this Programmatic EIS/EIR and will be analyzed in more detail in subsequent site-specific environmental documents. The following assumptions are associated with the operations of the new storage facilities.

Groundwater Storage. Maximum storage capacity of both upstream-of-Delta and off-aqueduct groundwater storage is assumed at 250 and 500 TAF, respectively. Diversion capacity for both upstream-of-Delta and off-aqueduct groundwater storage is assumed at 500 cfs, based on preliminary feasibility studies for Kern Water Bank. All in-stream flow requirements must be met before diversions to new storage are allowed. Discharge capacity for both upstream-of-Delta and off-aqueduct groundwater storage is also 500 cfs.

All new groundwater and conjunctive use facilities are primarily operated to maximize average dry-year deliveries. Groundwater extractions occur when critical shortages exist in the CVP/SWP system. This conservative groundwater operation limits third-party groundwater impacts and provides benefits to local groundwater basins. Groundwater operations would be conducted cooperatively with local sponsors under local control.

Storage Filling and Discharge Priorities. Filling of and discharging from new storage will be made with the following priorities (the following will be modified as necessary for consistency with local water management practices and water rights):

- Sacramento River Region groundwater storage facilities have first priority for filling and last priority for discharging from storage (withdrawals from groundwater basins will be made only in dry and critical years).

- Off-aqueduct groundwater storage facilities have second priority for filling and third priority for discharging from storage.

- Off-aqueduct surface storage facilities have third priority for filling and second priority for discharging from storage.

- Sacramento River and San Joaquin River Region surface storage facilities have fourth priority for filling and first priority for discharging from storage.

Sacramento River Region Surface Storage. Maximum capacity for Sacramento River Region surface storage is assumed at 3.0 MAF. Assumed diversion and discharge capacity is 5,000 cfs. All in-stream flow requirements must be met before diversions to new storage are allowed. Under Criterion A, diversions are not allowed unless an in-stream daily flow of 20,000 cfs exists below the diversion location. No additional flow requirements are specified as constraints to diversions under Criterion B. (Future studies will be conducted to refine the estimate of the flow need.)

San Joaquin River Region Surface Storage. San Joaquin River Region surface storage is modeled as a 260-TAF maximum capacity off-stream reservoir located between the Merced and Tuolumne Rivers. Spills in both rivers that exceed in-stream and Delta requirements are diverted into the reservoir. Diversion capacity is assumed at 2,000 cfs for the Merced River and 1,000 cfs for the Tuolumne River. No additional flow requirements are specified as constraints to diversions.

Off-Aqueduct Surface Storage. Maximum capacity for off-aqueduct surface storage is assumed to be 2 MAF. New storage is assumed to be connected to the California Aqueduct, with a 3,500-cfs diversion and discharge capacity.

- **Conveyance Configuration.** Each Program alternative or conveyance configuration is examined with and without new storage facilities under both water management criteria. The following assumptions are specific operations of each Program alternative and are in addition to the assumptions defined for existing conditions and the No Action Alternative.

Alternative 1/Preferred Program Alternative without Diversion Facility on the Sacramento River. Alternative 1 includes a new screened intake to CCFB. The evaluation in the Programmatic EIS/EIR needed to assume a location for the CCFB intake; however, future studies will determine the best location for the intake. For this evaluation, the intake is assumed to be constructed on Byron Tract south of the Los Vaqueros screen on Old River. Water would be siphoned under Italian Slough into the north end of the forebay. Intake operations to CCFB are simulated to match tidal stages, resulting in constant velocity through the intake screens. The intake would use low-lift variable speed pumps, operated with a less variable or "sipping" inflow pattern. Under maximum pumping conditions (10,300 cfs), CCFB inflows would range between 7,000 and 13,000 cfs during a tidal day. Old River is assumed to be dredged from Victoria Canal to Woodward Canal. This evaluation assumes that permanent operable flow control structures are installed in Old River, Middle River, and Grant Line Canal. A permanent fish control structure is installed at the head of Old River.

- The following assumptions are made for Criterion A:

  1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

  2. Increase Banks Pumping Plant capacity to 10,300 cfs in accordance with the Corp's October 31, 1981 Public Notice criteria modified from an existing 8,500-cfs maximum to a 10,300-cfs maximum in winter months.

- The following assumptions are made for Criterion B:

  1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

  2. Increase Banks Pumping Plant capacity to 10,300 cfs with no restrictions related to the Corp's October 31, 1981 Public Notice criteria.

Alternative 2. Alternative 2 includes the development of north Delta improvements, a 10,000-cfs screened intake near Hood, and south Delta improvements. For this evaluation, the same changes in the south Delta as described for Alternative 1 are assumed in place. In addition, a 10,000-cfs pumping plant near Hood and a 10,000-cfs open channel from near Hood to Lambert Road are assumed in place. Snodgrass Slough is enlarged by a 1,000-foot levee setback in the southwest corner of Glanville Tract. The flow down Snodgrass Slough is then allowed to pass through a flooded McCormack-Williamson Tract at levee openings in the northwest, the southwest, and the northeast corners of the island. The specific alignment of this channel is made for modeling purposes only. For this evaluation, the Mokelumne River is widened 500 feet by levee setback in three reaches: from I-5 to New Hope Landing, the North Fork of the Mokelumne River from New Hope Landing to the south end of Tyler Island, and the Lower Mokelumne River on the western portion of Bouldin Island.

- The following assumptions are made for Criterion A:

  1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

  2. Increase Banks Pumping Plant capacity to 10,300 cfs in accordance with the Corp's October 31, 1981 Public Notice criteria modified from an existing 8,500-cfs maximum to a 10,300-cfs maximum in winter.

  3. Diversion into the 10,000-cfs facility near Hood is governed by the following operations criteria:

     i. Maximum diversion near Hood of 5,000 cfs in May. In March of all years, the allowable diversion is 35% of Sacramento flow. The maximum diversion near Hood in April-May is 15% of Sacramento flow. In June of all years, the allowable diversion is 35% of Sacramento flow. The diversions near Hood also are limited to 50% of the south-of-Delta exports.

     ii. Rio Vista flow criteria of 3,000 cfs in July and August.

iii. DCC gates are closed for all months except in June for dry, critical, and below-normal water-year types, when gates are open.

- The following assumptions are made for Criterion B:

1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

2. Increase Banks Pumping Plant capacity to 10,300 cfs with no restrictions related to the Corp's October 31, 1981 Public Notice criteria.

3. Diversion into the 10,000-cfs facility near Hood is governed by the following operations criteria:

   i. Maximum diversion near Hood of 5,000 cfs in May. The diversions near Hood also are limited to 100% of the south of Delta exports.

   ii. Rio Vista flow criteria of 3,000 cfs in July and August.

   iii. DCC gates are closed, except for the months of July and August.

   iv. No water supply impact related to diversions near Hood due to downstream flow requirement at Rio Vista.

Alternative 3. Alternative 3 includes an isolated facility with a screened diversion on the Sacramento River near Hood that has a canal capacity of 5,000-15,000 cfs. Channel enlargements in the Mokelumne River system for flood control purposes and CCFB improvements are the same as described for Alternative 2. Under Alternative 3, an isolated facility between 5,000- and 15,000-cfs capacity could be constructed. To fully describe potential consequences of Alternative 3, a 15,000-cfs isolated facility is evaluated under Criterion A assumptions, and a 5,000-cfs isolated facility is evaluated under Criterion B assumptions. The 15,000-cfs isolated facility assumptions coupled with Criterion A and the 5,000-cfs isolated facility assumptions coupled with Criterion B serve as boundaries for a range of possible Delta inflows, isolated facility diversions, south Delta exports, and outflow patterns in this programmatic analysis.

- The following assumptions are made for Criterion A:

15,000-cfs Isolated Facility. Criterion A includes a 15,000-cfs isolated facility on the Sacramento River near Hood, along with the channel enlargements in the Mokelumne River system for flood control purposes and Clifton Court improvements identified for Alternative 2. A fish control structure at the head of Old River is assumed to be installed and operating. Irrigation water from the isolated facility is provided to service areas along the route of the canal.

1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

2. Increase Banks Pumping Plant capacity to 10,300 cfs.

3. Diversion into the 15,000-cfs isolated facility is governed by the following operations criteria:

   i. Maximum isolated facility diversion of 5,000 cfs in May.

   ii. Rio Vista flow criteria of 3,000 cfs in July and August.
   iii. DCC gates are closed for all months except in June (in dry, critical, and below-normal water-year types), July and August (in all water-year types).

   iv. Minimum through-Delta conveyance is specified at 1,000 cfs for the periods from October through March and July through September. There is no minimum through-Delta conveyance from April to June.

   v. Level 2 Delta agriculture diversions are delivered from the isolated facility.

   vi. The isolated facility conveyance is included in export restrictions.

- The following assumptions are made for Criterion B:

5,000-cfs Isolated Facility. Criterion B includes a 5,000-cfs isolated facility on the Sacramento River near Hood along with the channel enlargements in the Mokelumne River system and Clifton Court improvements identified for Alternative 2. Permanent flow control structures are installed in Old River, Middle River, and Grant Line Canal. A fish control structure at the head of Old River is assumed to be installed and operating.

1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

2. Increase Banks Pumping Plant capacity to 10,300 cfs.

3. Diversion into the 5,000-cfs isolated facility is governed by the following operations criteria:

   i. In March of all years, the allowable diversion is 35% of Sacramento flow. The maximum isolated facility diversion in April-May is 15% of Sacramento flow. In June of all years, the allowable diversion is 35% of Sacramento flow.

   ii. Rio Vista flow criteria of 3,000 cfs in July and August.

   iii. DCC gates are closed, except for the months of July and August.

   iv. Minimum through-Delta conveyance is specified at 1,000 cfs for the periods from October through March and July through September. There is no diversion from April to June.

   v. The isolated facility conveyance export is not included in inflow/export restrictions.

vi. No water supply impact is related to isolated facility diversions due to downstream flow requirement at Rio Vista.

- *Preferred Program Alternative.* The Preferred Program Alternative includes the development of north Delta facilities similar to Alternative 2. For evaluation purposes, the Preferred Program Alternative was simulated under two configurations: (1) with a new 2,000-cfs screened diversion from the Sacramento River to the Mokelumne River system, and (2) with a new 4,000-cfs screened diversion from the Sacramento River to the Mokelumne River system. Assumptions associated with simulation of the 2,000- to 4,000-cfs diversion facility on the Sacramento River are described below.

  Also for evaluation purposes, the Preferred Program Alternative was simulated without the diversion facility on the Sacramento River. The assumptions used for this simulation are those described for Alternative 1.

  - The following assumptions are made for Criterion A:

    1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

    2. Increase Banks Pumping Plant capacity to 10,300 cfs in accordance with the Corp's October 31, 1981 Public Notice criteria modified from an existing 8,500-cfs maximum to a 10,300-cfs maximum in winter months.

    3. Diversion into the 2,000-cfs facility on the Sacramento River is governed by the following operations criteria:

       i. In March of all years, the allowable diversion is 35% of Sacramento flow. The maximum diversion in April-May is 15% of Sacramento flow. In June of all years, the allowable diversion is 35% of Sacramento flow. The diversions also are limited to 50% of the south-of-Delta exports.

       ii. Rio Vista flow criteria of 3,000 cfs in July and August.

       iii. DCC gates are closed for all months except in June for dry, critical, and below normal year types.

  - The following assumptions are made for Criterion B:

    1. Assume full and unlimited joint point of diversion. SWP wheels for the CVP whenever unused capacity at Banks Pumping Plant is available.

    2. Increase Banks Pumping Plant capacity to 10,300 cfs. No restrictions are related to the Corp's October 31, 1981 Public Notice criteria.

3. Diversion into the 4,000-cfs facility on the Sacramento River is governed by the following operations criteria:

   i. The diversions are limited to 100% of the south-of-Delta exports.

   ii. Rio Vista flow criteria of 3,000 cfs in July and August.

   iii. DCC gates are closed, except for the months of July and August.

   iv. No water supply impact is related to diversions on the Sacramento River due to downstream flow requirement at Rio Vista.

A.4 ACTIONS THAT MAY CONTRIBUTE TO CUMULATIVE IMPACTS

Actions that may contribute to cumulative impacts are listed below and described in the following section. Cumulative impacts are discussed for each resource category in Chapters 5, 6, and 7. A summary of the potential cumulative impacts associated with these actions and the Preferred Program Alternative is presented in Chapter 3. Certain aspects of some of these projects are incorporated into the Preferred Program Alternative. These are identified by an asterisk (*) in the following list, along with identification (in parentheses) of which CALFED program the project is associated with.

- American River Water Resource Investigation
- American River Watershed Project
- CVPIA* (Ecosystem Restoration, Water Transfer, Water Use Efficiency, and Water Quality Programs)
- CCWD Multi-Purpose Pipeline Project
- Delta Wetlands Project* (Ecosystem Restoration Program)
- Hamilton City Pumping Plant Fish Screen Improvement Project* (Ecosystem Restoration Program)
- Interim South Delta Plan (ISDP)* (Conveyance Element)
- Montezuma Wetlands Project* (Ecosystem Restoration Program)
- Pardee Reservoir Enlargement Project
- Red Bluff Diversion Dam Fish Passage Program* (Ecosystem Restoration Program)
- Sacramento River Flood Control System Evaluation (partial)

- Sacramento Water Forum Process* (Ecosystem Restoration Program)
- Trinity River Restoration Program* (proposed flows are included in modeling assumptions for the Preferred Program Alternative)
- EBMUD Supplemental Water Supply Project
- Sacramento County M&I Water Supply Contracts
- Urbanization* (future population growth is included in modeling assumptions for the Preferred Program Alternative)
- West Delta Water Management Program* (Ecosystem Restoration Program)
- Sacramento River Conservation Area Program* (Ecosystem Restoration Program)

A brief description is provided for each of the projects that may contribute to cumulative effects. The responsible agency or group is identified in parentheses.

American River Water Resource Investigation (Reclamation). The American River Water Resource Investigation (ARWRI) began in 1992 as a follow-up to the American River Watershed Investigation (ARWI). The project focuses on evaluating potential alternative solutions to meeting water-related needs in portions of Sutter, Placer, El Dorado, Sacramento, and San Joaquin Counties. The alternatives that have been analyzed in the Final EIS/EIR for the ARWRI include: conjunctive use (between groundwater and surface water sources), conjunctive use with new storage (possible reservoir sites include Clay Station, Deer Creek, Dutch Creek, Small Alder, South Gulch, Texas Hill, and possible enlargement of the existing Farmington Reservoir), and construction of a full-size Auburn Reservoir. In the Final EIS issued in September 1997, Reclamation indicated that a federal action associated with this program had not been identified.

American River Watershed Project (Corps). The ARWI studies address the flooding and flood-related problems in the American River basin. The ARWI focused on the system of levees, weirs, and bypasses along the Sacramento River and its tributaries in the vicinity of Natomas; Folsom Dam and the levees along the lower American River downstream from the dam; and the reach of the river above Folsom near the city of Auburn, where flood storage capacity could be added.

The ARWI studies resulted in the 1991 ARWI Feasibility Report, which recommended construction of levee and related improvements in the Natomas area of Sacramento and a flood distribution dam on the North Fork American River upstream from Folsom Reservoir. Construction of the Natomas portion of the plan is complete. Further studies are now being conducted on the plans. Three plans were analyzed in detail in the American River Watershed Project Supplemental EIS (August 1995) to address flood protection below Folsom and Auburn: the Folsom Plan, the Folsom Stepped Release Plan, and the Detention Dam Plan.

Central Valley Project Improvement Act (Reclamation). The CVPIA mandates changes in management of the CVP, particularly operation of the CVP to dedicate and manage 800 TAF per year of CVP water for the protection, restoration, and enhancement of fish and wildlife. The CVP is the system of reservoirs,

powerplants, pumping plants, and canals managed by Reclamation in California. The combined storage capacity is about 12 MAF, which accounts for approximately 25% of California's developed surface water supply. The Department of the Interior is developing policies and programs to (1) modify the operations, management, and physical facilities of the CVP; and (2) renew existing CVP water services and repayment contracts to comply with the purposes and goals of the CVPIA, which reduces deliveries to CVP water service contractors, and the revised purposes of the CVP.

Physical measures to restore fish and habitat include: establishment of fish screening programs, development and implementation of measures at the Red Bluff Diversion Dam to minimize fish passage problems, expansion of the USFWS's existing hatchery facility, modification of the Keswick Dam fish trap and spillway to prevent trapping of fish, development and implementation of a continuing program to restore and replenish lost spawning gravel in the upper Sacramento River, development and implementation of a program that provides for modified operations or new and improved control structures at the DCC and Georgiana Slough, and design and construction of a new fish protection structure at the Glenn County Irrigation District pumping facility near Hamilton City.

The Final CVPIA Programmatic EIS was released on October 29, 1999.

Contra Costa Water District Multi-Purpose Pipeline Project. The CCWD has proposed this project to supplement the Contra Costa Canal and provide adequate water transmission capacity to meet the projected demand for CCWD through 2020. The proposed action is the construction and operation of two water pipelines and supporting pumping facilities. The project involves the following improvements:

- **Multi-Purpose Pipeline.** This pipeline would supplement the capacity of the Contra Costa Canal. CCWD is evaluating two pipeline alignments.

- **Raw Water Pipeline.** The project also includes a raw water pipeline. The raw water pipeline could be installed parallel to the adjacent multi-purpose pipeline.

Delta Wetlands Project (Delta Wetlands Corporation). This project would improve and strengthen levees on two "reservoir islands" and two "habitat islands," and install two additional intake siphon stations and a new pump station on each of the reservoir islands. Fish screens would be installed on all new and existing siphons on the reservoir and habitat islands. The project would divert surplus Delta inflows, transferred water, or banked water onto the reservoir islands during periods of availability throughout the year to be stored later for sale or release for Delta export, or to meet water quality or flow requirements for the Bay-Delta estuary during periods of demand.

The initial water storage capacity of the reservoir islands would be 238 TAF and increase to 260 TAF in 50 years due to soil subsidence. The mean annual diversion and discharge is estimated to be 222-225 TAF and 180-202 TAF, respectively. Both reservoir islands could be filled and emptied in approximately 1 month. The Delta Wetlands diversion could occur in any month but would occur only when the volume of allowable water for export is greater than the permitted pumping rate of the export pumps.

Hamilton City Pumping Plant Fish Screen Improvement Project (Reclamation, Corps, GCID, and DFG). The Hamilton City Pumping Plant Fish Screen Improvement Project will address concerns over impacts on salmon and other fish species from water diversion operations at the Hamilton City Pumping Plant. The preferred alternative will minimize loss of all fish species in the vicinity of the pumping plant diversion while

maximizing the Glenn-Colusa Irrigation District's (GCID's) capability to divert the full quantity of water that it is entitled to divert in order to meet its water supply delivery obligations. The preferred alternative includes an extension of the existing fish screen, internal fish bypasses, improvements to the intake and bypass channel, and a gradient facility.

The final EIR/EIS has been certified, and construction commenced in 1998.

Interim South Delta Program (DWR and Reclamation). The objectives of the ISDP were to improve water levels and circulation in south Delta channels for local agricultural diversions; improve south Delta hydraulic conditions to increase diversions into CCFB, in order to optimize the frequency of full pumping capacity at the Banks Pumping Plant; and improve fishery conditions for salmon migrating along the San Joaquin River.

The preferred alternative for the ISDP was comprised of selected channel dredging of a 4.9-mile reach of Old River from the northwest corner of the CCFB to North Victoria Canal; construction and operation of a new intake gate at CCFB; and construction and operation of four radial gate flow-control structures in the south Delta—to increase water supply availability for local diverters and improve local fishery conditions. In addition, the DWR was seeking a permit from the Corps to divert up to 20,430 acre-feet of water per day on a monthly averaged basis from the Delta into CCFB. Collectively, these actions were intended to enhance the management of south Delta water resources to benefit local diverters, Delta fisheries, and SWP water supply.

A Draft EIS/EIR and Section 404(b)(1) analysis for ISDP were released for public review and comment in July 1996. The draft documents identified both beneficial and adverse impacts associated with the implementation of ISDP. During the public review of the Draft EIR/EIS, compatibility of ISDP with the CALFED Program, including the ISDP impacts on the ecosystem, was identified as a main issue of concern. To address the compatibility concerns, the ISDP was fully integrated into the CALFED Program, as a part of the Lower San Joaquin River and South Delta Region Bundle. Therefore, the ISDP no longer exists.

Montezuma Wetlands Project (Corps and Solano County). This project calls for constructing facilities to receive up to 20 million cubic yards of approved dredged materials from ports and navigation channels in the San Francisco Bay Estuary and to distribute the materials over a 2,394-acre diked bayland site near Collinsville in Solano County, adjacent to Suisun Marsh. After filling the subsided baylands, the levees would be breached to enable tides and ebb to flow over the constructed foundation of tidal channels and low marsh plains. The marsh design includes high marsh and marsh ponds that would seldom be reached by tides.

The project would restore 1,822 acres of tidal wetlands on the bayland site. Project construction is proposed to be in four phases to minimize temporary losses of wetlands during construction and to facilitate engineered placement of the dredged materials. Each completed phase would be hydrologically independent, with a single connection to Montezuma Slough or the Sacramento River.

Pardee Reservoir Enlargement Project (EBMUD). EBMUD's primary water supply is the Sierra-Nevada mountains. The supply is regulated by several projects, including two district reservoirs, Pardee Reservoir (210 TAF) and Camanche Reservoir (417 TAF). Water from Pardee Reservoir is conveyed 90 miles to the East Bay via EBMUD's Mokelumne Aqueducts. In January 1995, EBMUD initiated studies aimed at meeting the district's need for water by 2002, including (1) joint project options with San Joaquin and/or

Sacramento County interests involving EBMUD's American River entitlement, and (2) surface storage options, such as the enlargement of Pardee Reservoir by 150-200 TAF.

The specific facility improvements associated with the Pardee Reservoir enlargement include: raising the main dam, modifying or replacing the spillway; modifying the powerhouse; raising or replacing a secondary dam near the existing Jackson Creek outlet; modifying or replacing the intake tower; modifying Pardee tunnel and Aqueduct facilities at Campo Seco, replacing the SR 49 bridge over the Mokelumne River and making roadway modifications, and modifying or replacing existing recreational facilities. A key construction concern is the level, duration, and timing of any reservoir drawdown.

Red Bluff Diversion Dam Fish Passage Program (Reclamation). This program includes evaluating possible long-term solutions to fish passage and water delivery problems at the Red Bluff Diversion Dam. Operation of the Red Bluff Diversion Dam under the NMFS biological opinion has substantially reduced, but not eliminated, fish passage problems and has created water delivery problems during planting and harvest seasons. Engineering and biological evaluations are continuing, and interim measures have been developed to supply water during the 8-month "gates up" period of operation. A research pumping facility was installed in 1994 to evaluate potential means of pumping water to ensure availability of sufficient water while using the existing drum screen. Field and laboratory studies of fish ladder alternatives and a hydrological study are in progress.

Sacramento River Flood Control System Evaluation (Corps). The Sacramento River Flood Control System includes 980 miles of levees. The system is designed to provide varying degrees of flood protection to lands adjacent to the Sacramento River from Chico Landing near Red Bluff south to Collinsville in the Sacramento-San Joaquin Delta, and the lower reaches of several tributaries including the American River. The purpose of the evaluation study is to determine whether the system is functioning as designed or whether remedial work is required to restore the levees to their previously established design and function.

The reevaluation is being conducted in five phases. Phase I, the Sacramento Urban Area Levee Restoration Project, was completed in 1994. Phase II focuses on the levee systems along the Feather and Yuba Rivers in the cities of Marysville and Yuba City. Phase III focuses on the mid-valley area between Sacramento, Marysville-Yuba City, and the Yolo Bypass from Fremont Weir to south of Putah Creek. Phase IV focuses on the levees in the Delta from Sacramento through Collinsville. Phase V concentrates on the levees of the upper Sacramento River north to Chico Landing.

Sacramento Water Forum Process (Local Governments and Water Districts). The Water Forum began as a diverse group of business and agricultural leaders, environmentalists, citizen groups, water managers, and local governments in Sacramento County. In 1995, they were joined by water managers in Placer and El Dorado Counties. The group was formed to address regional concerns of water shortage, environmental degradation, contamination, threats to groundwater reliability, limits to economic prosperity, and competition from other areas for water. The Water Forum has two co-equal objectives:

- Provide a reliable and safe water supply for the region's economic health and planned development through to the year 2030.

- Preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

In January 1997, the Forum made available their Draft Recommendations for a Water Forum Agreement for public review and comment. Within the Draft Recommendations are seven elements, each of which is necessary for meeting the Water Forum objectives. The seven elements are:

- Increased surface water diversion.
- Alternative water supplies to meet customers' needs while reducing diversion impacts on the lower American River in drier years.
- An improved pattern of fishery flow releases from Folsom Reservoir.
- Lower American River habitat mitigation.
- Water conservation.
- Groundwater management.
- Water Forum success effort.

Trinity River Restoration Actions (USFWS and Reclamation). The Trinity River Restoration Program was established through Public Law (PL) 98-541 (since amended) to restore and maintain the fish and wildlife stocks of the Trinity River Basin to those levels that existed just prior to the construction of the Trinity River Division of the CVP.

The Trinity River Division was authorized by Congress in part to increase the supply of water available for irrigation and other beneficial uses in the Central Valley. Facilities were authorized for control and storage of water from Clear Creek and Trinity River flows. Water from the Trinity River is stored in Trinity Lake (formerly Claire Engle Lake) behind Trinity Dam. Lewiston Dam regulates flows to meet the downstream requirement of the Trinity River Basin. Water from the Trinity River is diverted through J. F. Carr and Spring Creek Power Plants to the Sacramento River to meet the water demands in the Sacramento Valley and other areas of the CVP.

Since the Trinity River Basin Fish and Wildlife Management Act (PL 98-541) was enacted, a number of positive benefits have occurred, including:

- Modernization of the Lewiston Hatchery to provide fish for stocking programs and construction of the Buckhorn Debris Dam to effectively control sedimentation.
- Purchase and rehabilitation of 17,000 acres of highly eroded land in the Grass Valley watershed.
- Replacement of spawning gravel below Lewiston Dam.
- Reestablishment of the river's meandering channels.
- Feathering of the Trinity River's edges to encourage natural fish spawning and rearing.

Reauthorization of the Act in 1995 continued the efforts of restoration of the South Fork Trinity River's fish habitat and implementation of a comprehensive wildlife management program for all affected species.

In addition, as part of the CVPIA, Reclamation in coordination with the USFWS is responsible for (1) protection of the fishery resource of the Hoopa Valley Tribe, to meet fishery restoration goals of the Trinity River Basin Fish and Wildlife Restoration Act; (2) development and implementation of in-stream flow recommendations for the Trinity River based on the best available scientific data; and (3) provision of a deadline to complete the Trinity River Flow Evaluation Study, which was implemented in 1984.

In October 1984, the USFWS began a 12-year study to describe the effectiveness of increased flows and other habitat restoration activities to restore fishery populations in the Trinity River. An EIS/EIR is being prepared to evaluate alternatives to restore and maintain natural production of anadromous fish in the Trinity River mainstem downstream from Lewiston Dam. Approximately 1.3 MAF of water annually has been diverted from the Trinity River to the Sacramento River system. A change in the Trinity River flow requirements and a corresponding change in the amount diverted to the Sacramento River system could affect future flows to the Delta and overall water supply reliability, as well as carryover storage in Shasta Reservoir and water quality and temperature in the Sacramento River.

Supplemental Water Supply Project (EBMUD). This project will allow EBMUD to take delivery of its Reclamation contract entitlement for American River water.

Reclamation and EBMUD are considering the following alternatives in the Supplemental Water Supply Project for diversion and conveyance of American River water:

- A joint project between EBMUD, the City of Sacramento, and the Sacramento County Water Agency, which would involve the construction of a new intake-pumping facility and fish screens on the American River near its confluence with the Sacramento River, a pipeline from this diversion to the City's E. A. Fairbairn Water Treatment Plant, a pipeline henceforth to the Folsom South Canal (FSC), and a connection from the FSC to EBMUD's Mokelumne Aqueducts. This alternative would require a change in the point of delivery of water for EBMUD and an amendment to the existing Reclamation contract.

- A pipeline connection from the FSC at the current contract turnout location near Grant Line Road to the EBMUD Mokelumne Aqueducts. This alternative could be implemented without amending the existing Reclamation contract.

- A pipeline connection from the terminus of the FSC to the EBMUD Mokelumne Aqueducts near Clements, California. This alternative would require a change in the point of delivery of water for EBMUD and an amendment to the existing Reclamation contract.

- A pipeline connection from the terminus of the FSC to the EBMUD Mokelumne Aqueducts near Stockton, California. This alternative would require a change in the point of delivery of water for EBMUD and an amendment to the existing Reclamation contract.

Sacramento County Municipal and Industrial Water Supply Contracts (Reclamation). PL 101-514, specifically Section 206(b)(1), directs the Secretary of Interior to enter into long-term M&I water supply contracts to meet immediate water needs of Sacramento County. The law directs the Secretary to enter into contracts

for up to 22 TAF annually with Sacramento County Water Agency (Agency) and 13 TAF annually with the San Juan Water District. From its allocation, the Agency intends to deliver up to 7 TAF annually to the City of Folsom. The project area includes the lower American River, the Sacramento River from Shasta Reservoir to the Sacramento-San Joaquin River Delta, Folsom Reservoir, and the upstream Sacramento River reservoirs.

The Agency's contracted water supply would serve development in the southern and eastern portions of Sacramento County. The Agency's subcontracted supply to the City of Folsom would serve development in the City of Folsom's East Area. The San Juan Water District would use the acquired water in a multi-district subarea encompassing certain portions of the district's service area in Sacramento County.

The Agency's proposed action includes surface water diversions on the Sacramento River at the existing Sacramento River Water Treatment Plant intake or at a new treatment plant near Freeport on the Sacramento River or on the lower American River near its mouth. The San Juan Water District's proposed action includes diversion at Folsom Dam and treatment at the Sydney Peterson Treatment Plant and the City of Folsom's water treatment plant.

A Draft EIS/EIR was released in summer 1997, and a re-circulated draft EIR was released in summer 1998.

Urbanization. The growth of population in California creates a demand for land for residential, commercial, and infrastructure use. Bulletin 160-98 estimates California's 2020 population at 47.5 million, a substantial increase from the 1995 level of 32.1 million.

Urbanization is expected to result in significant conversion of agricultural lands throughout the state and in Program study areas. According to the October 1995 American Farmland Trust Summary, the population is expected to triple in California's Central Valley between now and 2040, putting tremendous pressure on agricultural land and public services. If more compact and efficient placement of growth occurred, about 474,000 acres of farmland would be converted. The report concluded that low-density urban sprawl could consume more than 1 million acres of farmland by 2040. A 1992 study by the Association of Bay Area Governments that projected land use patterns based on population growth, found that an addition of 331,530 acres of urbanized land would be required (a 37% increase by 2005) if full development in the 12-county Bay-Delta Region occurred, including affecting 39,511 acres of mostly farmed wetlands in the Delta.

West Delta Water Management Program (NDWA and DWR). The North Delta Water Agency (NDWA) and DWR signed an agreement in 1981 to ensure that the State will maintain a water supply that is dependable and of adequate quality for agricultural uses within the boundaries of the NDWA's system. The agreement provides for installation of an overland facility to provide a dependable water supply on Sherman Island. An alternative under consideration is the Sherman Island Wildlife Management Plan. Final design of the overland facility is subject to approval by NDWA and Sherman Island's Reclamation District 341. The agency and the reclamation district also must approve a contract amendment if the wildlife plan is to be substituted for the overland facility.

Since the agreement was signed, an unstable agricultural economy, continuing problems with subsidence, levee instability, and loss of wetland and riparian habitats have necessitated a more comprehensive planning approach.

Implementation of the program involves the following main elements:

- Amending the 1981 agreement between the NDWA and DWR.
- Acquiring land on both Sherman and Twitchell Islands.
- Implementing the Sherman Island and Twitchell Island Wildlife Management Plans.
- Improving threatened levees on both islands as part of the State's Delta Flood Control Act of 1988 levee program.
- Securing a memorandum of agreement (MOA) from State and federal permitting agencies.
- Completing detailed final designs for both islands.

The proposed land acquisition phase is part of a joint program between DWR and DFG to implement the wildlife management plans. DWR purchased more than 3,000 acres of Twitchell Island (approximately 80% of the island) in 1993. DWR also has purchased much of Sherman Island.

Implementation of the wildlife management plans will be accomplished in several stages. Currently, the properties are being managed for grazing and agriculture. DWR also is investigating the possibility of limited managed hunting programs prior to development of wildlife habitat. In the future, a wetland/riparian/upland complex of habitats will be constructed for the benefit of wintering waterfowl and an array of species.

Sacramento River Conservation Area Program (Federal, State, and Local Agencies and Private Interest Groups). SB 1086, Upper Sacramento River Fisheries and Riparian Habitat Management Plan, was passed in 1986 and called for development of a management plan to protect, restore, and enhance the fish and riparian habitat and associated wildlife of the upper Sacramento River (from Keswick Dam to the confluence with the Feather River). The plan was prepared by a 25-member Advisory Council and a working-level Action Team, both representing a wide range of federal, state, and local agencies and private interests concerned with the upper Sacramento River. Following more than 50 lengthy meetings and workshops over a 2-year period, the plan was completed and submitted to the State Legislature in 1989. This was an early example of a "consensus planning" process, often cited as the "prototype" example in California.

The management plan contains a conceptual proposal for riparian habitat restoration along the main river and its tributaries, and a more specific fishery restoration plan with 20 specific actions intended to restore the salmon and steelhead fisheries of the river and its tributaries. In 1993, Secretary for Resources Wheeler reconvened the SB 1086 Council and asked it to (1)advise state agencies responsible for implementing those portions of the CVPIA that are likely to affect the upper Sacramento River and adjacent lands; and (2) complete the earlier work concerning riparian habitat protection and management, including development of a specific implementation program.

Since 1993, the multi-agency Riparian Habitat Committee of the Advisory Council and a multitude of stakeholders have worked to develop a comprehensive Sacramento River Conservation Area plan for the river. The group has now reached consensus and recently published the Sacramento River Conservation Area Handbook. The handbook is a creative way to provide a comprehensive understanding of the

Sacramento River ecosystem for both the public and agencies managing the river. The committee has developed an MOA among these diverse groups, which is being reviewed prior to final agreement. The committee has hired a coordinator and plans to establish a non-profit organization to coordinate and manage the program.

The handbook, MOA, and non-profit organization represent the beginning of a new era in river corridor management—in which all stakeholders (including local, state, and federal agencies; public interest groups; and landowners) are closely involved in the planning and decision making process, as well as the implementation.

SACRAMENTO RIVER REGION
(Including Upper Trinity River Watershed)

DELTA REGION

SAN JOAQUIN RIVER REGION

BAY REGION

OTHER SWP AND CVP
SERVICE AREAS

DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
TRINITY
SHASTA
LASSEN
TEHAMA
PLUMAS
MENDOCINO
GLENN
BUTTE
SIERRA
NEVADA
COLUSA
YUBA
PLACER
LAKE
SUTTER
EL DORADO
SONOMA
YOLO
ALPINE
SACRAMENTO
AMADOR
NAPA
SOLANO
CALAVERAS
TUOLUMNE
MARIN
CONTRA COSTA
SAN JOAQUIN
MONO
SAN FRANCISCO
ALAMEDA
STANISLAUS
MARIPOSA
SAN MATEO
SANTA CLARA
MERCED
MADERA
SANTA CRUZ
FRESNO
SAN BENITO
INYO
TULARE
MONTEREY
KINGS
SAN LUIS OBISPO
KERN
SAN BERNARDINO
SANTA BARBARA
VENTURA
LOS ANGELES
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL

CALFED BAY-DELTA PROGRAM

N
W E
S

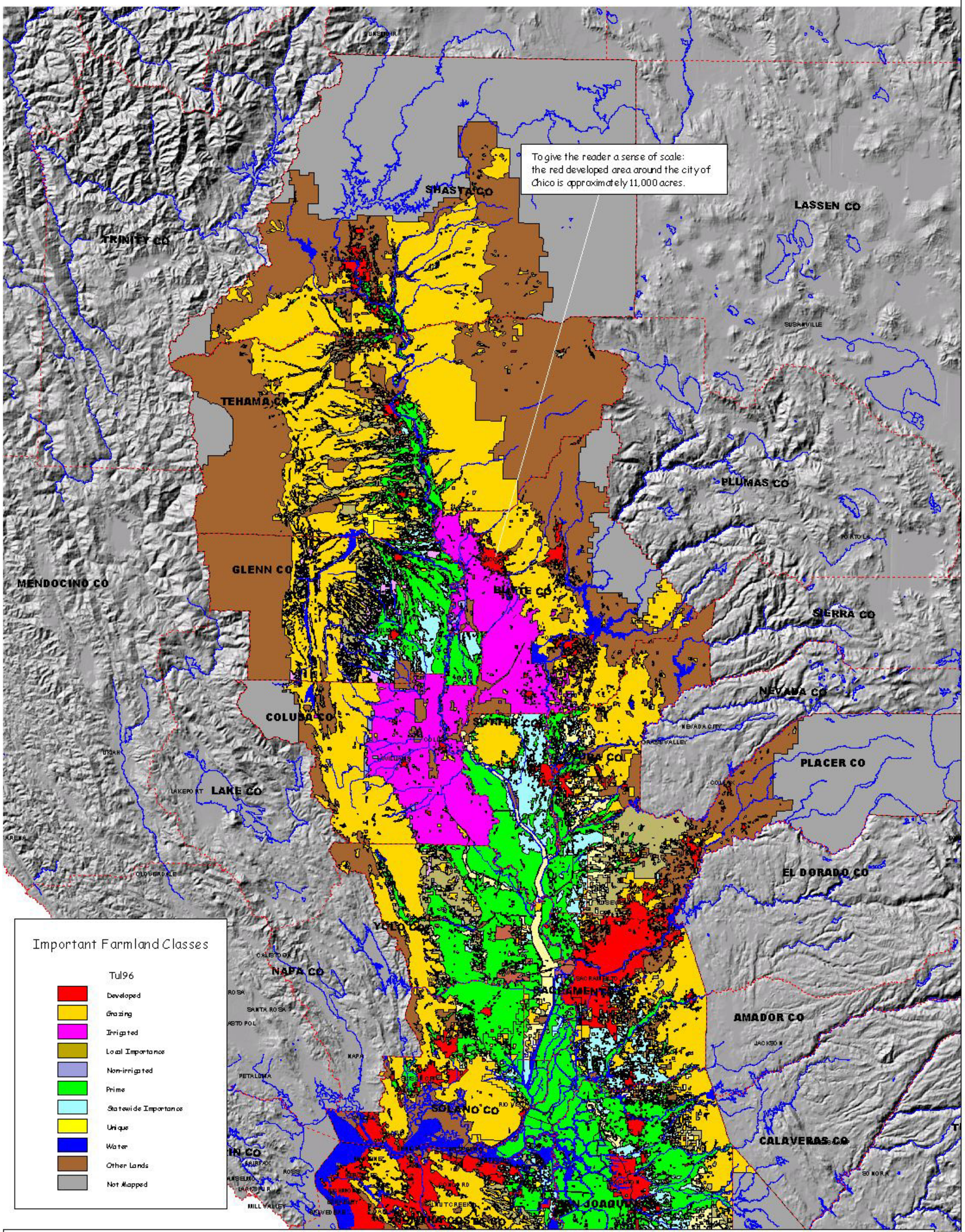
50 0 50 Miles

Sources: USBR, DFG

CALFED Bay-Delta Program Programmatic EIS/EIR Study Area

IMPORTANT FARMLAND (1996)

Sacramento Valley



Sources: Cal. Dept. of Conservation, Farmland Mapping & Monitoring Program, Dept. of Fish and Game, USBR, USGS, Teale Data Center

Counties with interim classifications like "irrigated" and "non-irrigated" lands do not have completed modern soil surveys.

For county by county statistics and land classification descriptions, please see Dept. of Conservation's Farmland Mapping & Monitoring Program website: http://consrv.ca.gov/dlrp/FMMP/

5 0 5 10 15 Miles

Teale Albers Projection

CALFED BAY-DELTA PROGRAM

IMPORTANT FARMLAND (1996)
San Joaquin Valley

To give the reader a sense of scale:
the red developed area around the city of Modesto is approximately 30,000 acres.

CALAVERAS CO
TUOLUMNE CO
MONO CO
SAN JOAQUIN CO
STANISLAUS CO
MARIPOSA CO
MERCED CO
MADERA CO
FRESNO CO
SAN BENITO CO
FRESNO CO
TULARE CO
KINGS CO
KERN CO
KERN CO
SAN LUIS OBISPO CO

Important Farmland Classes

Tul96

- Developed
- Grazing
- Irrigated
- Local Importance
- Non-irrigated
- Prime
- Statewide Importance
- Unique
- Water
- Other Lands
- Not Mapped

Sources: Ca. Dept. of Conservation, Farmland Mapping & Monitoring Program, Dept. of Fish and Game, USBR, USGS, Teale Data Center

Counties with interim classifications like "irrigated" and "non-irrigated" lands do not have completed modern soil surveys.

For county by county statistics and land classification descriptions, please see Dept. of Conservation's Farmland Mapping Program website:
http:\\consrv.ca.gov/dlrp/FMMP/mr&sd.htm

5 0 5 10 15 Miles

Teale Albers Projection

N W E S

CALFED BAY-DELTA PROGRAM